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METHOD AND APPARATUS FOR LAMINATING GLASS SHEETS

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(71) Applicant(s)
TAMGLASS ENGINEERING OY

(72) Inventor(s)
ESKO LEHTO

(74) Attorney or Agent
PHILLIPS ORMONDE & FITZPATRICK , 367 Collins Street, MELBOURNE VIC 3000

(56) Prior Art Documents
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(57) Claim

1. A method for laminating glass sheets, in which method a plastic film is laid between glass sheets and a resulting sandwich structure is carried through a first pair of press rolls, followed by heating the sandwich element such that the glass and film have a temperature which rises to the temperature range of 60°C - 85°C and carrying the heated sandwich structure through a second pair of press rolls, wherein upstream of the first pressing the sandwich structure is preheated with radiation heat and between the pressing operations the sandwich structure is heated by means of two-sided hot-air blasting.

5. An apparatus for laminating glass sheets, said apparatus including a first pair of press rolls, a second pair of press rolls, a horizontal conveyor between the pairs of press rolls as well as heating elements for heating a sandwich structure consisting of glass sheets and a plastic film, wherein upstream of the first pair of press rolls is a preheating station provided with radiation heating elements for the preheating of said sandwich structure, and wherein said heating elements, located between the pairs of press rolls, include equipment for blasting hot air to both surfaces of the sandwich structure.

According to one aspect, the present invention provides a method as described at the outset wherein upstream of the first pressing the sandwich structure is preheated with radiation heat and between the pressing operations the sandwich structure is heated by means of two-sided hot-air blasting.

In a preferred embodiment of the invention, in order to bring the first-sequence radiation heating to heat as effectively and evenly as possible the interior of the sandwich structure, the radiating surface used in radiation heating has a temperature which is within the range of 1600°C - 1900°C, preferably about 1800°C, the radiation including mostly radiation that has a wavelength within the range of appr. 1,5 μm - 1,3 μm, preferably about 1,4 μm.

In the second heating sequence, however, the convection air must have its maximum temperature limited to a relatively low temperature in view of applying an effective convection without excessively raising the sandwich structure surface temperature. In this respect, it is preferred that the air blasted to both surfaces of the sandwich structure have a temperature of about 80°C - 120°C.

According to another aspect, the invention provides an apparatus as described previously wherein upstream of the first pair of press rolls is a preheating station provided with radiation heating elements for the preheating of said sandwich structure, and wherein said heating elements, located between the pairs of press rolls, include equipment for blasting hot air to both surfaces of the sandwich structure.

The above features of the invention will be more fully appreciated from the following detailed description of preferred embodiments of the invention with reference made to the accompanying drawings, in which

fig. 1 shows the essential components of an apparatus of the invention in a side view;

fig. 4 shows the nozzle block of fig. 3 in a side view and

fig. 5 shows the nozzle block in a section alc..g the line V-V in fig. 4.

In a laminating room, which is not shown, the glass sheets to be laminated are placed on top of each other with a plastic film therebetween. The layers are loosely on top of each other and arrive at substantially room temperature at a conveyor consisting of rollers 6. Above and below the conveyor are radiation heating elements, especially incandescent filament resistances 7, 8, for preheating the sandwich structure to be laminated. A radiating surface included in the filament resistances have a temperature which is within the range of about 1600°C - 1900°C, preferably about 1800°C, the radiation including mostly radiation that has a wavelength within the range of appr. 1,5 µm - 1,3 µm, preferably about 1,4 µm. Short-wave heat radiation produced by a high temperature has been found to penetrate most effectively within the interior of a sandwich structure, the preheating being as even as possible. The sandwich structure is preheated with radiation heat to a temperature of about 30°C - 45°C, whereby the film softens sufficiently for achieving between press rolls a contact as complete as possible between the glass and film surfaces, said contact remaining intact even after the pressing. Without the preheating, however, the film would shrink or contract sufficiently to re-form voids between the surfaces after the pressing.

From between the press rolls 3 the sandwich structure emerges onto a conveyor consisting of rollers 3 and provided thereabove and -below with nozzle blocks 4 and 5 for blasting warm air to the opposite surfaces of the sandwich structure. The more detailed configuration of nozzle blocks 4 and 5 is shown in figs. 3-5. Each block includes two rows of orifices 9 in quite a densely staggered array and the direc-

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for laminating glass sheets, in which method a plastic film is laid between glass sheets and a resulting sandwich structure is carried through a first pair of press rolls, followed by heating the sandwich element such that the glass and film have a temperature which rises to the temperature range of 60°C - 85°C and carrying the heated sandwich structure through a second pair of press rolls, wherein upstream of the first pressing the sandwich structure is preheated with radiation heat and between the pressing operations the sandwich structure is heated by means of two-sided hot-air blasting.

2. A method as claimed in claim 1, wherein the radiating surface used in radiation heating has a temperature within the range of about 1600°C - 1900°C, preferably about 1800°C, the radiation mostly including radiation having a wavelength within the range of about 1,5 μm - 1,3 μm, preferably about 1,4 μm.

3. A method as claimed in claim 1 or claim 2, wherein the sandwich structure to be laminated is preheated with radiation heat to a temperature of about 30°C - 45°C.

4. A method as claimed in claim 1 or claim 2, wherein the air blasted to both surfaces of the sandwich structure has a temperature of about 80°C - 120°C.

5. An apparatus for laminating glass sheets, said apparatus including a first pair of press rolls, a second pair of press rolls, a horizontal conveyor between the pairs of press rolls as well as heating elements for heating a sandwich structure consisting of glass sheets and a plastic film, wherein upstream of the first pair of press rolls is a preheating station provided with radiation heating elements for the preheating of said sandwich structure, and wherein said heating elements, located between the pairs of press rolls, include equipment for blasting hot air to both surfaces of the sandwich structure.

(57) Abstract

The invention relates to a method and apparatus for laminating glass sheets. A sandwich structure to be laminated is preheated with radiation heat to a temperature of about 30°C - 45°C. This is followed by a first pressing operation between a pair of rolls (1). Next, the sandwich structure is heated by two-sided hot-air blasting (4, 5) for raising the temperature of glass and film to a temperature range of 60°C - 85°C. This is followed by a pressing operation between a second pair of press rolls.

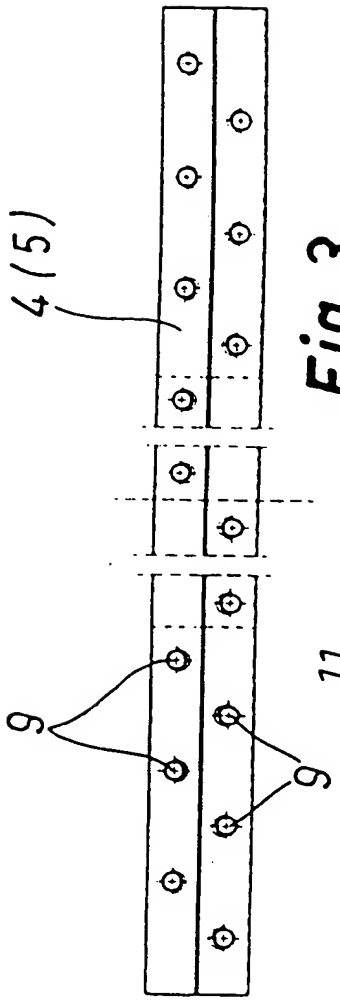

Fig. 3

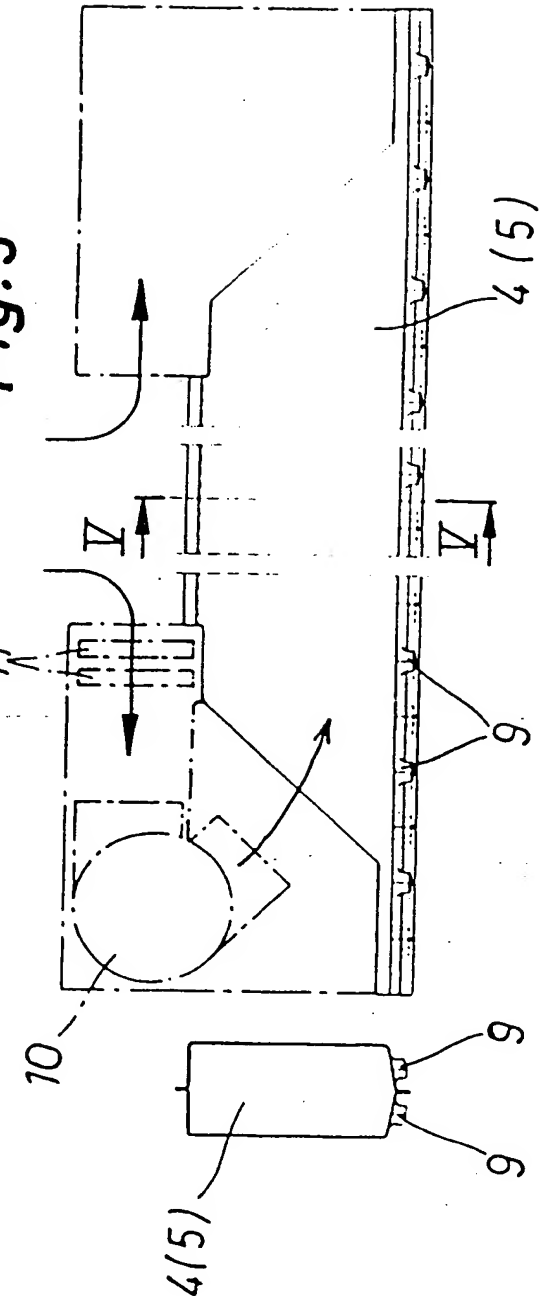

Fig. 4

Fig. 5